



## United States Department of the Interior

FISH AND WILDLIFE SERVICE  
South Florida Ecological Services Office  
1339 20<sup>th</sup> Street  
Vero Beach, Florida 32960



March 23, 2007

David S. Hobbie  
Chief, Regulatory Division  
U.S. Army Corps of Engineers  
Palm Beach Gardens Regulatory Office  
4400 PGA Boulevard, Suite 500  
Palm Beach Gardens, Florida 33410

Attention: John F. Studt

Service Federal Activity Code: 41420-2006-FA-0494

Service Consultation Code: 41420-2006-I-0835

Corps Application: Multi-County Programmatic

Concurrence Request

Dates Received: March 8, 2006 and December 12, 2006

Counties: Miami-Dade, Broward, Palm Beach,

Martin, St. Lucie, Indian River,

Okeechobee, Osceola, Polk, and Monroe

Dear Mr. Hobbie:

The Fish and Wildlife Service's South Florida Ecological Services Office (Service) and the U.S. Army Corps of Engineers Jacksonville District (Corps) have been working together on efforts to streamline the consultation process for federally listed species associated with the Corps' wetland permitting program. The Corps has requested a multi-county programmatic concurrence with a determination of "may affect, not likely to adversely affect" (NLAA) for the threatened eastern indigo snake (*Drymarchon corais couperi*) and the endangered wood stork (*Mycteria americana*) as related to projects involving freshwater wetland impacts within specified counties. The specified counties are Miami-Dade (within the urban development boundary), Broward, Palm Beach, Martin, St. Lucie, Indian River, Okeechobee, Osceola, Polk, and Monroe. This letter is submitted in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*).

### **Eastern indigo snake**

#### Habitat

Over most of its range, the eastern indigo snake frequents several habitat types, including pine flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammocks, edges of



freshwater marshes, agricultural fields, coastal dunes, and human-altered habitats (Service 1999). Eastern indigo snakes appear to need a mosaic of habitats to complete their life cycle. Wherever the eastern indigo snake occurs in xeric habitats, it is closely associated with the gopher tortoise (*Gopherus polyphemus*), the burrows of which provide shelter from winter cold and summer desiccation (Speake et al. 1978; Layne and Steiner 1996). Interspersion of tortoise-inhabited uplands and wetlands improves habitat quality for this species (Landers and Speake 1980; Auffenberg and Franz 1982).

Even though thermal stress may not be a limiting factor throughout the year in south Florida, eastern indigo snakes still seek and use underground refugia in the region. On the sandy central ridge of central Florida, eastern indigos use gopher tortoise burrows more (62 percent) than other underground refugia (Layne and Steiner 1996). Other underground refugia used include armadillo (*Dasypus novemcinctus*) burrows near citrus groves, cotton rat (*Sigmodon hispidus*) burrows, and land crab (*Cardisoma guanhum*) burrows in coastal areas (Wilson and Porras 1983). Natural ground holes, hollows at the base of trees or shrubs, ground litter, trash piles, and crevices of rock-lined ditch walls are also used (Layne and Steiner 1996). These refugia are used most frequently where tortoise burrows are not available, principally in low-lying areas off the central and coastal ridges. In extreme south Florida (the Everglades and Florida Keys), eastern indigo snakes are found in tropical hardwood hammocks, pine rocklands, freshwater marshes, abandoned agricultural land, coastal prairie, mangrove swamps, and human-altered habitats (Steiner et al. 1983). It is suspected that they prefer hammocks and pine forests, because most observations occur in these habitats disproportionately to their presence in the landscape (Steiner et al. 1983). Hammocks may be important breeding areas as juveniles are typically found there. The eastern indigo snake is a snake-eater so the presence of other snake species may be a good indicator of habitat quality.

### Conservation Measures

The Service routinely concurs with the Corps' NLAA determination for individual project effects to the eastern indigo snake when assurances are given that our *Standard Protection Measures for the Eastern Indigo Snake* (Service 2002) will be used during project site preparation and project construction (Appendix 1). There is no designated critical habitat for the eastern indigo snake.

In an effort to reduce correspondence in effect determinations and responses, the Service is providing an Eastern Indigo Snake Effect Determination Key, similar in utility to the Florida Panther Effect Determination Key and the West Indian Manatee Effect Determination Key presently being utilized by the Corps. If the use of this key results in a Corps determination of "no effect" for a particular project, the Service supports this determination. If the use of this Key results in a determination of NLAA, the Service concurs with this determination and no additional correspondence will be necessary<sup>1</sup>. This key is subject to revisitation as the Corps and Service deem necessary.

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<sup>1</sup> With an outcome of "no effect" or "NLAA" as outlined in this key, the requirements of section 7 of the Act are fulfilled for the eastern indigo snake and no further action is required.

The Key is as follows:

- A. Project is not located in open water .....go to B  
 Project is located solely in open water ..... “no effect”
- B. Permit will be conditioned for use of the Service’s *Standard Protection Measures For The Eastern Indigo Snake* during site preparation and project construction.....go to C  
 Permit will not be conditioned as above for the eastern indigo snake, or it is not known whether an applicant intends to use these measures and consultation with the Service is requested<sup>2</sup> ..... “may affect”
- C. There are gopher tortoise burrows, holes, cavities, or other refugia where a snake could be buried or trapped and injured during project activities.....go to D  
 There are no gopher tortoise burrows, holes, cavities, or other refugia where a snake could be buried or trapped and injured during project activities..... “NLAA”
- D. The project will impact less than 25 acres of xeric habitat supporting less than 25 active and inactive gopher tortoise burrows.....go to E  
 The project will impact more than 25 acres of xeric habitat or more than 25 active and inactive gopher tortoise burrows and consultation with the Service is requested<sup>2</sup> ..... “may affect”
- E. Any permit will be conditioned such that all gopher tortoise burrows, active or inactive, will be evacuated prior to site manipulation in the vicinity of the burrow<sup>3</sup>. If an indigo snake is encountered, the snake must be allowed to vacate the area prior to additional site manipulation in the vicinity. Any permit will also be conditioned such that holes, cavities, and snake refugia other than gopher tortoise burrows will be inspected each morning before planned site manipulation of a particular area, and, if occupied by an indigo snake, no work will commence until the snake has vacated the vicinity of proposed work ..... “NLAA”

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<sup>2</sup> Consultation may be concluded informally or formally depending on project impacts.

<sup>3</sup> If burrow excavation is utilized, it should be performed by experienced personnel. The method used should minimize the potential for injury of an indigo snake. The applicant should follow the enclosed Excavation Guidelines (Appendix 2). A member of the excavation team should be authorized for Incidental Take during excavation through a section 10(a)(1)(A) permit issued by the Service.

Permit will not be conditioned as outlined above and consultation with the  
Service is requested<sup>2</sup> ..... “*may affect*”

## **Wood stork**

### Habitat

The wood stork is primarily associated with freshwater and estuarine habitats that are used for nesting, roosting, and foraging. Wood storks typically construct their nests in medium to tall trees that occur in stands located either in swamps or on islands surrounded by relatively broad expanses of open water (Ogden 1991; Rodgers et al. 1996). Successful colonies are those that have limited human disturbance and low exposure to land-based predators. Nesting colonies protected from land-based predators are characterized as those surrounded by large expanses of open water or where the nest trees are inundated at the onset of nesting and remain inundated throughout most of the breeding cycle. These colonies have water depths between 0.9 and 1.5 meters (3 and 5 feet) during the breeding season.

Successful nesting generally involves combination of average or above-average rainfall during the summer rainy season and an absence of unusually rainy or cold weather during the winter-spring breeding season (Kahl 1964; Rodgers et al. 1987). This pattern produces widespread and prolonged flooding of summer marshes, which maximize production of freshwater fishes, followed by steady drying that concentrate fish during the season when storks nest (Kahl 1964). Successful nesting colonies are those that have a large number of foraging sites. To maintain a wide range of foraging sites a variety of wetland types should be present, with both short and long hydroperiods. The Service (1999) describes a short hydroperiod as a 1 to 5-month wet/dry cycle, and a long hydroperiod as greater than 5 months. During the wet season, wood storks generally feed in the shallow water of the short-hydroperiod wetlands and in coastal habitats during low tide. During the dry season, foraging shifts to longer hydroperiod interior wetlands as they progressively dry down (though usually retaining some surface water throughout the dry season).

During the nonbreeding season or while foraging, wood storks occur in a wide variety of wetland habitats. Typical foraging sites for the wood stork include freshwater marshes and stock ponds, shallow, seasonally flooded roadside or agricultural ditches, narrow tidal creeks or shallow tidal pools, managed impoundments, and depressions in cypress heads and swamp sloughs. Because of their specialized feeding behavior, wood storks forage most effectively in shallow-water areas with highly concentrated prey. Through tactolocation, or grope feeding, wood storks in south Florida feed almost exclusively on fish between 1 and 10 inches (2 and 25 centimeters (cm)) in length (Ogden et al. 1976). Good foraging conditions are characterized by water that is relatively calm, uncluttered by dense thickets of aquatic vegetation, and having a water depth between 5 and 15 inches (5 and 38 cm) deep. Ideally, preferred foraging wetlands would include a mosaic of emergent and shallow open-water areas. The emergent component provides nursery habitat for small fish, frogs, and other aquatic prey and the shallow, open-water areas provide sites for concentration of the prey during seasonal dry-down of the wetland.

### Conservation Measures

The Service routinely concurs with the Corps' "may affect, not likely to adversely affect" determination for individual project effects to the wood stork when project effects are insignificant due to scope or location, or if assurances are given that wetland impacts have been avoided, minimized, and adequately compensated such that there is no net loss in foraging potential. We utilize our *Habitat Management Guidelines For The Wood Stork In The Southeast Region* (Service 1990) (Appendix 3) (HGM) in project evaluation as well as our *Draft Supplemental Habitat Management Guidelines for the Wood Stork in South Florida* (Appendix 4). The HGM is currently under review and once final will replace the enclosed HGM. There is no designated critical habitat for the wood stork.

The Service's South Florida Field Office has identified an 18.6-mile core foraging area (CFA) around all known wood stork colonies in south Florida that is important for reproductive success. Appendix 5 (to be updated annually) provides locations of colonies and their CFAs in south Florida documented as active within the last 10 years. The Service believes loss of suitable foraging wetlands within these CFAs may reduce foraging opportunities for the wood stork. To minimize adverse effects to the wood stork, it is our position that there should be compensation for wood stork foraging habitat lost due to the action. The compensation shall consider wetland type, location, function, and value (hydrology, vegetation, prey utilization), to ensure wetlands provided as compensation adequately replace wetland functions lost due to the project. Wetlands offered as compensation ideally should be of the same hydroperiod and located within the CFAs of the affected wood stork colonies. The Service may accept, in some cases, wetland compensation located outside the CFAs of the affected wood stork nesting colonies. Specifically, wetland credits purchased from a "Service Approved" mitigation bank located outside the CFAs could be acceptable to the Service, depending on location of impacted wetlands relative to the permitted service area of the bank, and whether or not the bank has wetlands having the same hydroperiod as the impacted wetland.

In an effort to reduce correspondence in effect determinations and responses, the Service is providing a Wood Stork Effect Determination Key, similar in utility to the Eastern Indigo Snake Effect Determination Key previously presented. If the use of this key results in a Corps determination of "no effect" for a particular project, the Service supports this determination. If the use of this Key results in a determination of NLAA, the Service concurs with this determination and no additional correspondence will be necessary<sup>4</sup>. This Key is subject to revisitation as the Corps and Service deem necessary.

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<sup>4</sup> With an outcome of "no effect" or "NLAA" as outlined in this key, the requirements of section 7 of the Act are fulfilled for the wood stork and no further action is required.

The Key is as follows:

- A. Project does not affect suitable foraging habitat<sup>5</sup> (SFH).....*no effect*<sup>7</sup>  
     Project within 0.54 mile of an active colony site<sup>6</sup> ..... *“may affect”*<sup>7</sup>  
     Project impacts suitable foraging habitat (SFH) at a location greater than 0.54 mile from a colony site .....*go to B*
- B. Project impact to SFH is from a single-family residence<sup>8</sup> .....*“NLAA”*<sup>4</sup>  
     Project impact to SFH is greater in scope than a single-family residence.....*go to C*
- C. Project impacts to SFH not within the Core Foraging Area (CFA = 18.6 miles) of a colony site .....*go to D*  
     Project impacts to SFH within the CFA of a colony site .....*go to E*
- D. Project impacts to SFHs have been avoided and minimized to the extent practicable, and compensation for unavoidable impacts is proposed in accordance with the CWA section 404(b)(1) guidelines, with no net loss of wetland function..... *NLAA*<sup>4</sup>  
     Project not as above..... *“may affect”*<sup>7</sup>
- E. Project provides SFH compensation in accordance with the CWA section 404(b)(1) guidelines and is not contrary to the habitat management guidelines; habitat compensation is within the appropriate CFA or within the service area of a Service-approved mitigation bank; and habitat compensation that replaces foraging value, consisting of

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<sup>5</sup> Suitable foraging habitat is described as wetland communities with shallow-open water areas that are relatively calm, uncluttered by dense thickets of aquatic vegetation, and having a water depth between 2 and 15 inches (5 to 38 cm) deep. Ideally, preferred foraging wetlands would include a mosaic of emergent and shallow open-water areas.

<sup>6</sup> An active colony is defined as a colony that is currently being used for nesting by wood storks or has historically over the last 10 years been used for nesting by wood storks.

<sup>7</sup> Consultation may be concluded informally or formally depending on project impacts.

<sup>8</sup> On an individual basis, development of a single-family residence generally will not have a measurable effect on wood storks. Wood storks are a wide ranging species, and individually, habitat change from development of a single-family residence is not likely to adversely affect wood storks. However, collectively they may have an effect and therefore regular monitoring and reporting of these effects are important.

wetland enhancement or restoration matching the hydroperiod<sup>9</sup> of the wetlands affected, and providing foraging value similar to, or higher than, that of impacted wetlands (see Appendix 6 for guidance<sup>10</sup>)..... *NLAA*<sup>4</sup>,

Project does not satisfy these elements ..... “may affect”<sup>7</sup>

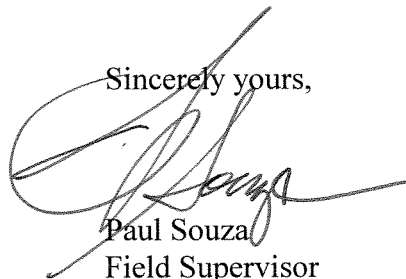
These Keys will not apply to Comprehensive Everglades Restoration Plan projects, as they will require project-specific consultations with the Service.

### Monitoring and Reporting Effects

For the Service to monitor cumulative effects, it is important for the Corps to monitor the number of permits and provide information to the Service regarding the number of permits issued that were determined “may affect, not likely to adversely affect.” It is requested that information on date, Corps identification number, project acreage, project wetland acreage, latitude and longitude in decimal degrees, and county parcel identification number of these projects be sent to the Service quarterly.

Thank you for your cooperation and effort in protecting federally listed species. If you have any questions, please contact Brad Rieck at 772-562-3909, extension 231, or Allen Webb at extension 246.

Sincerely yours,



Paul Souza

Field Supervisor

South Florida Ecological Services Office

Enclosures

<sup>9</sup> Several researchers (Flemming et al. 1994; Ceilley and Bortone 2000) believe that the short hydroperiod wetlands provide a more important pre-nesting foraging food source and a greater early nestling survivor value for woodstorks than the foraging base (grams of fish per square meter) that short hydroperiod wetlands suggest. Although the short hydroperiod wetlands may provide less fish, these prey bases historically were more extensive and provided foraging needs of the pre-nesting storks and the early-age nestlings. Nest productivity may suffer as a result of the loss of short hydroperiod provisions. We believe that most wetland fill and excavation impacts permitted in southeast Florida are in short hydroperiod wetlands. Therefore, we believe that it is especially important that impacts to these short hydroperiod wetlands within CFAs are avoided, minimized, and compensated for by enhancement/restoration of short hydroperiod wetlands.

<sup>10</sup> This draft document, *Wood Stork Foraging Habitat Assessment Procedure*, by Passarella and Associates, Incorporated, may serve as further guidance in ascertaining wetland foraging value to wood storks and compensating for impacts to wood stork foraging habitat.

David S. Hobbie

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cc: (w/ enclosures)

Corps, Jacksonville, Florida (Stu Santos)

EPA, West Palm Beach, Florida (Richard Harvey)

FWC, Vero Beach, Florida (Joe Walsh)

Service, Jacksonville, Florida (Billy Brooks)

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## Appendix I

## STANDARD PROTECTION MEASURES FOR THE EASTERN INDIGO SNAKE

1. An eastern indigo snake protection/education plan shall be developed by the applicant or requestor for all construction personnel to follow. The plan shall be provided to the Service for review and approval at least 30 days prior to any clearing activities. The educational materials for the plan may consist of a combination of posters, videos, pamphlets, and lectures (*e.g.*, an observer trained to identify eastern indigo snakes could use the protection/education plan to instruct construction personnel before any clearing activities occur). Informational signs should be posted throughout the construction site and along any proposed access road to contain the following information:
  - a. a description of the eastern indigo snake, its habits, and protection under Federal Law;
  - b. instructions not to injure, harm, harass or kill this species;
  - c. directions to cease clearing activities and allow the eastern indigo snake sufficient time to move away from the site on its own before resuming clearing; and,
  - d. telephone numbers of pertinent agencies to be contacted if a dead eastern indigo snake is encountered. The dead specimen should be thoroughly soaked in water and then frozen.
2. If not currently authorized through an Incidental Take Statement in association with a Biological Opinion, only individuals who have been either authorized by a section 10(a)(1)(A) permit issued by the Service, or by the State of Florida through the Florida Fish Wildlife Conservation Commission (FWC) for such activities, are permitted to come in contact with an eastern indigo snake.
3. An eastern indigo snake monitoring report must be submitted to the appropriate Florida Field Office within 60 days of the conclusion of clearing phases. The report should be submitted whether or not eastern indigo snakes are observed. The report should contain the following information:
  - a. any sightings of eastern indigo snakes and
  - b. other obligations required by the Florida Fish and Wildlife Conservation Commission, as stipulated in the permit.

Revised February 12, 2004

## Appendix 2

## **Excavation Guidelines**

In areas where the water table is high, gopher tortoise burrows may be commonly 8 to 10 feet long and have an angle of decline of 4:1 to a depth of less than 3 feet. Where the water table is not a restriction, length has reached 67 feet with a depth of 21 feet.

A team of at least 3 experienced persons is desired for the excavation of each burrow: one to dig with shovel or machinery; one to scope and track the burrow tunnel utilizing pvc pipe or other tracer; and one to coordinate, hand-scoop and handle any occupants of the burrow (holder of FWC and/or Service permit).

Excavation may be done manually by shovel, if, for instance, burrows are shallow (high ground water table). Otherwise, excavation by backhoe is a common option. Any digging machinery must be equipped with a tooth-less bucket/digging blade for burrow excavation.

Digging should begin at the mouth of the burrow and carefully follow the tunnel path, as identified by the tracer, to the end chamber. If a backhoe is used, the bucket should remove soil by “dragging” along the path of the tunnel, rather than maximizing soil removal by “gouging”. The backhoe should be positioned behind the burrow mouth and scrape along the line of the tracer. The backhoe should not dig any closer than approximately six inches to the top of the tunnel, as soil should be removed at this point by hand, progressively, as the team works together towards the end chamber. Special attention should be exercised in navigating to the end chamber, as the tunnel frequently turns 20-30 degrees at its beginning. Soil removal in the end chamber should be by hand with attention to signs of occupancy.

## Appendix 3

# HABITAT MANAGEMENT GUIDELINES FOR THE WOOD STORK IN THE SOUTHEAST REGION



**HABITAT MANAGEMENT GUIDELINES  
FOR THE WOOD STORK IN THE  
SOUTHEAST REGION**

Prepared by

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# **HABITAT MANAGEMENT GUIDELINES FOR THE WOOD STORK**

## **IN THE SOUTHEAST REGION**

### **Introduction**

A number of Federal and state laws and/or regulations prohibit, cumulatively, such acts as harrassing, disturbing, harming, molesting, pursuing, etc., wood storks, or destroying their nests (see Section VII). Although advisory in nature, these guidelines represent a biological interpretation of what would constitute violations of one or more of such prohibited acts. Their purpose is to maintain and/or improve the environmental conditions that are required for the survival and well-being of wood storks in the southeastern United States, and are designed essentially for application in wood stork/human activity conflicts (principally land development and human intrusion into stork use sites). The emphasis is to avoid or minimize detrimental human-related impacts on wood storks. These guidelines were prepared in consultations with state wildlife agencies and wood stork experts in the four southeastern states where the wood stork is listed as Endangered (Alabama, Florida, Georgia, South Carolina).

### **General**

The wood stork is a gregarious species, which nests in colonies (rookeries), and roosts and feeds in flocks, often in association with other species of long-legged water birds. Storks that nest in the southeastern United States appear to represent a distinct population, separate from the nearest breeding population in Mexico. Storks in the southeastern U.S. population have recently (since 1980) nested in colonies scattered throughout Florida, and at several central-southern Georgia and coastal South Carolina sites. Banded and color-marked storks from central and southern Florida colonies have dispersed during non-breeding seasons as far north as southern Georgia, and the coastal counties in South Carolina and southeastern North Carolina, and as far west as central Alabama and northeastern Mississippi. Storks from a colony in south-central Georgia have wintered between southern Georgia and southern Florida. This U.S. nesting population of wood storks was listed as endangered by the U.S. Fish and Wildlife Service on February 28, 1984 (*Federal Register* 49(4):7332-7335).

Wood storks use freshwater and estuarine wetlands as feeding, nesting, and roosting sites. Although storks are not habitat specialists, their needs are exacting enough, and available habitat is limited enough, so that nesting success and the size of regional populations are closely regulated by year-to-year differences in the quality and quantity of suitable habitat. Storks are especially sensitive to environmental conditions at feeding sites; thus, birds may fly relatively long distances either daily or between regions annually, seeking adequate food resources.

All available evidence suggests that regional declines in wood stork numbers have been largely due to the loss or degradation of essential wetland habitat. An understanding of the qualities of good stork habitat should help to focus protection efforts on those sites

that are seasonally important to regional populations of wood storks. Characteristics of feeding, nesting, and roosting habitat, and management guidelines for each, are presented here by habitat type.

## **I. Feeding habitat.**

A major reason for the wood stork decline has been the loss and degradation of feeding habitat. Storks are especially sensitive to any manipulation of a wetland site that results in either reduced amounts or changes in the timing of food availability.

Storks feed primarily (often almost exclusively) on small fish between 1 and 8 inches in length. Successful foraging sites are those where the water is between 2 and 15 inches deep. Good feeding conditions usually occur where water is relatively calm and uncluttered by dense thickets of aquatic vegetation. Often a dropping water level is necessary to concentrate fish at suitable densities. Conversely, a rise in water, especially when it occurs abruptly, disperses fish and reduces the value of a site as feeding habitat.

The types of wetland sites that provide good feeding conditions for storks include: drying marshes or stock ponds, shallow roadside or agricultural ditches, narrow tidal creeks or shallow tidal pools, and depressions in cypress heads or swamp sloughs. In fact, almost any shallow wetland depression where fish tend to become concentrated, either through local reproduction or the consequences of area drying, may be used by storks.

Nesting wood storks do most of their feeding in wetlands between 5 and 40 miles from the colony, and occasionally at distances as great as 75 miles. Within this colony foraging range and for the 110-150 day life of the colony, and depending on the size of the colony and the nature of the surrounding wetlands, anywhere from 50 to 200 different feeding sites may be used during the breeding season.

Non-breeding storks are free to travel much greater distances and remain in a region only for as long as sufficient food is available. Whether used by breeders or non-breeders, any single feeding site may at one time have small or large numbers of storks (1 to 100+), and be used for one to many days, depending on the quality and quantity of available food. Obviously, feeding sites used by relatively large numbers of storks, and/or frequently used areas, potentially are the more important sites necessary for the maintenance of a regional population of birds.

Differences between years in the seasonal distribution and amount of rainfall usually mean that storks will differ between years in where and when they feed. Successful nesting colonies are those that have a large number of feeding site options, including sites that may be suitable only in years of rainfall extremes. To maintain the wide range of feeding site options requires that many different wetlands, with both relatively short and long annual hydroperiods, be preserved. For example, protecting only the larger wetlands, or those with longer annual hydroperiods, will result in the eventual loss of smaller, seemingly less important wetlands. However, these small scale wetlands are crucial as the only available feeding sites during the wetter periods when the larger habitats are too deeply flooded to be used by storks.

## II. Nesting habitat.

Wood storks nest in colonies, and will return to the same colony site for many years so long as that site and surrounding feeding habitat continue to supply the needs of the birds. Storks require between 110 and 150 days for the annual nesting cycle, from the period of courtship until the nestlings become independent. Nesting activity may begin as early as December or as late as March in southern Florida colonies, and between late February and April in colonies located between central Florida and South Carolina. Thus, full term colonies may be active until June-July in south Florida, and as late as July-August at more northern sites. Colony sites may also be used for roosting by storks during other times of the year.

Almost all recent nesting colonies in the southeastern U.S. have been located either in woody vegetation over standing water, or on islands surrounded by broad expanses of open water. The most dominant vegetation in swamp colonies has been cypress, although storks also nest in swamp hardwoods and willows. Nests in island colonies may be in more diverse vegetation, including mangroves (coastal), exotic species such as Australian pine (*Casuarina*) and Brazilian Pepper (*Schinus*), or in low thickets of cactus (*Opuntia*). Nests are usually located 15-75 feet above ground, but may be much lower, especially on island sites when vegetation is low.

Since at least the early 1970's, many colonies in the southeastern U.S. have been located in swamps where water has been impounded due to the construction of levees or roadways. Storks have also nested in dead and dying trees in flooded phosphate surface mines, or in low, woody vegetation on mounded, dredge islands. The use of these altered wetlands or completely "artificial" sites suggests that in some regions or years storks are unable to locate natural nesting habitat that is adequately flooded during the normal breeding season. The readiness with which storks will utilize water impoundments for nesting also suggests that colony sites could be intentionally created and maintained through long-term site management plans. Almost all impoundment sites used by storks become suitable for nesting only fortuitously, and therefore, these sites often do not remain available to storks for many years.

In addition to the irreversible impacts of drainage and destruction of nesting habitat, the greatest threats to colony sites are from human disturbance and predation. Nesting storks show some variation in the levels of human activity they will tolerate near a colony. In general, nesting storks are more tolerant of low levels of human activity near a colony when nests are high in trees than when they are low, and when nests contain partially or completely feathered young than during the period between nest construction and the early nestling period (adults still brooding). When adult storks are forced to leave their nests, eggs or downy young may die quickly (<20 minutes) when exposed to direct sun or rain.

Colonies located in flooded environments must remain flooded if they are to be successful. Often water is between 3 and 5 feet deep in successful colonies during the nesting season. Storks rarely form colonies, even in traditional nesting sites, when they are dry, and may abandon nests if sites become dry during the nesting period. Flooding in colonies may be most important as a defense against mammalian predators. Studies of stork colonies in Georgia and

Florida have shown high rates of raccoon predation when sites dried during the nesting period. A reasonably high water level in an active colony is also a deterrent against both human and domestic animal intrusions.

Although nesting wood storks usually do most feeding away from the colony site (>5 miles), considerable stork activity does occur close to the colony during two periods in the nesting cycle. Adult storks collect almost all nesting material in and near the colony, usually within 2500 feet. Newly fledged storks, near the end of the nesting cycle, spend from 1-4 weeks during the fledging process flying locally in the colony area, and perched in nearby trees or marshy spots on the ground. These birds return daily to their nests to be fed. It is essential that these fledging birds have little or no disturbance as far out as one-half mile within at least one or two quadrants from the colony. Both the adults, while collecting nesting material, and the inexperienced fledglings, do much low, flapping flight within this radius of the colony. At these times, storks potentially are much more likely to strike nearby towers or utility lines.

Colony sites are not necessarily used annually. Regional populations of storks shift nesting locations between years, in response to year-to-year differences in food resources. Thus, regional populations require a range of options for nesting sites, in order to successfully respond to food availability. Protection of colony sites should continue, therefore, for sites that are not used in a given year.

### **III. Roosting habitat.**

Although wood storks tend to roost at sites that are similar to those used for nesting, they also use a wider range of site types for roosting than for nesting. Non-breeding storks, for example, may frequently change roosting sites in response to changing feeding locations, and in the process, are inclined to accept a broad range of relatively temporary roosting sites. Included in the list of frequently used roosting locations are cypress "heads" or swamps (not necessarily flooded if trees are tall), mangrove islands, expansive willow thickets or small, isolated willow "islands" in broad marshes, and on the ground either on levees or in open marshes.

Daily activity patterns at a roost vary depending on the status of the storks using the site. Non-breeding adults or immature birds may remain in roosts during major portions of some days. When storks are feeding close to a roost, they may remain on the feeding grounds until almost dark before making the short flight. Nesting storks traveling long distances (>40 miles) to feeding sites may roost at or near the latter, and return to the colony the next morning. Storks leaving roosts, especially when going long distances, tend to wait for mid-morning thermals to develop before departing.

### **IV. Management zones and guidelines for feeding sites.**

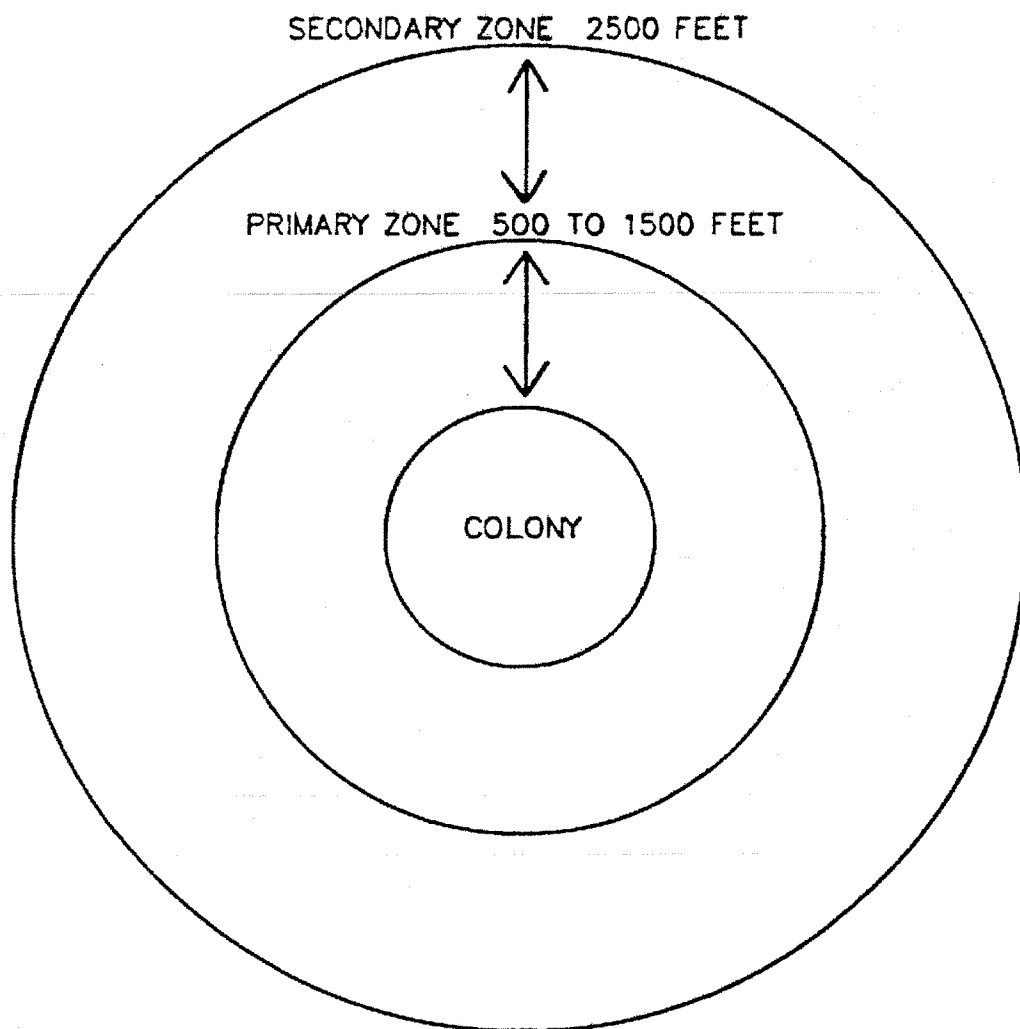
To the maximum extent possible, feeding sites should be protected by adherence to the following protection zones and guidelines:

- A. There should be no human intrusion into feeding sites when storks are present. Depending upon the amount of screening vegetation, human activity should be no closer than between 300 feet (where solid vegetation screens exist) and 750 feet (no vegetation screen).

- B. Feeding sites should not be subjected to water management practices that alter traditional water levels or the seasonally normal drying patterns and rates. Sharp rises in water levels are especially disruptive to feeding storks.
- C. The introduction of contaminants, fertilizers, or herbicides into wetlands that contain stork feeding sites should be avoided, especially those compounds that could adversely alter the diversity and numbers of native fishes, or that could substantially change the characteristics of aquatic vegetation. Increase in the density and height of emergent vegetation can degrade or destroy sites as feeding habitat.
- D. Construction of tall towers (especially with guy wires) within three miles, or high power lines (especially across long stretches of open country) within one mile of major feeding sites should be avoided.

**V. Management zones and guidelines for nesting colonies.**

- A. Primary zone: This is the most critical area, and must be managed according to recommended guidelines to insure that a colony site survives.
  - 1. Size: The primary zone must extend between 1000 and 1500 feet in all directions from the actual colony boundaries when there are no visual or broad aquatic barriers, and never less than 500 feet even when there are strong visual or aquatic barriers. The exact width of the primary zone in each direction from the colony can vary within this range, depending on the amount of visual screen (tall trees) surrounding the colony, the amount of relatively deep, open water between the colony and the nearest human activity, and the nature of the nearest human activity. In general, storks forming new colonies are more tolerant of existing human activity, than they will be of new human activity that begins after the colony has formed.
  - 2. Recommended Restrictions:
    - a. Any of the following activities within the primary zone, at any time of the year, are likely to be detrimental to the colony:
      - (1) Any lumbering or other removal of vegetation, and
      - (2) Any activity that reduces the area, depth, or length of flooding in wetlands under and surrounding the colony, except where periodic (less than annual) water control may be required to maintain the health of the aquatic, woody vegetation, and
      - (3) The construction of any building, roadway, tower, power line, canal, etc.
    - b. The following activities within the primary zone are likely to be detrimental to a colony if they occur when the colony is active:
      - (1) Any unauthorized human entry closer than 300 feet of the colony, and



- (2) Any increase or irregular pattern in human activity anywhere in the primary zone, and
  - (3) Any increase or irregular pattern in activity by animals, including livestock or pets, in the colony, and
  - (4) Any aircraft operation closer than 500 feet of the colony.
- B. Secondary Zone: Restrictions in this zone are needed to minimize disturbances that might impact the primary zone, and to protect essential areas outside of the primary zone. The secondary zone may be used by storks for collecting nesting material, for roosting, loafing, and feeding (especially important to newly fledged young), and may be important as a screen between the colony and areas of relatively intense human activities.
- 1. Size: The secondary zone should range outward from the primary zone 1000-2000 feet, or to a radius of 2500 feet of the outer edge of the colony.
  - 2. Recommended Restrictions:
    - a. Activities in the secondary zone which may be detrimental to nesting wood storks include:
      - (1) Any increase in human activities above the level that existed in the year when the colony first formed, especially when visual screens are lacking, and
      - (2) Any alteration in the area's hydrology that might cause changes in the primary zone, and
      - (3) Any substantial (>20 percent) decrease in the area of wetlands and woods of potential value to storks for roosting and feeding.
    - b. In addition, the probability that low flying storks, or inexperienced, newly-fledged young will strike tall obstructions, requires that high-tension power lines be no closer than one mile (especially across open country or in wetlands) and tall transmission towers no closer than 3 miles from active colonies. Other activities, including busy highways and commercial and residential buildings may be present in limited portions of the secondary zone at the time that a new colony first forms. Although storks may tolerate existing levels of human activities, it is important that these human activities not expand substantially.

## VI. Roosting site guidelines.

The general characteristics and temporary use-patterns of many stork roosting sites limit the number of specific management recommendations that are possible:

- A. Avoid human activities within 500-1000 feet of roost sites during seasons of the year and times of the day when storks may be present. Nocturnal activities in active roosts may be especially disruptive.

- B. Protect the vegetative and hydrological characteristics of the more important roosting sites--those used annually and/or used by flocks of 25 or more storks. Potentially, roosting sites may, some day, become nesting sites.

## VII. Legal Considerations.

### A. Federal Statutes

The U.S. breeding population of the wood stork is protected by the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)(Act). The population was listed as endangered on February 28, 1984 (49 Federal Register 7332); wood storks breeding in Alabama, Florida, Georgia, and South Carolina are protected by the Act.

Section 9 of the Endangered Species Act of 1973, as amended, states that it is unlawful for any person subject to the jurisdiction of the United States to take (defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.") any listed species anywhere within the United States.

The wood stork is also federally protected by its listing (50 CFR 10.13) under the Migratory Bird Treaty Act (167 U.S.C. 703-711), which prohibits the taking, killing or possession of migratory birds except as permitted.

### B. State Statutes

#### 1. State of Alabama

Section 9-11-232 of Alabama's Fish, Game, and Wildlife regulations curtails the possession, sale, and purchase of wild birds. "Any person, firm, association, or corporation who takes, catches, kills or has in possession at any time, living or dead, any protected wild bird not a game bird or who sells or offers for sale, buys, purchases or offers to buy or purchase any such bird or exchange same for anything of value or who shall sell or expose for sale or buy any part of the plumage, skin, or body of any bird protected by the laws of this state or who shall take or willfully destroy the nests of any wild bird or who shall have such nests or eggs of such birds in his possession, except as otherwise provided by law, shall be guilty of a misdemeanor..."

Section 1 of the Alabama Nongame Species Regulation (Regulation 87-GF-7) includes the wood stork in the list of nongame species covered by paragraph (4). "It shall be unlawful to take, capture, kill, possess, sell, trade for anything of monetary value, or offer to sell or trade for anything of monetary value, the following nongame wildlife species (or any parts or reproductive products of such species) without a scientific collection permit and written permission from the Commissioner, Department of Conservation and Natural Resources,..."

#### 2. State of Florida

Rule 39-4.001 of the Florida Wildlife Code prohibits "taking, attempting to take, pursuing, hunting, molesting, capturing, or killing (collectively defined as "taking"), transporting, storing, serving, buying, selling,

possessing, or wantonly or willingly wasting any wildlife or freshwater fish or their nests, eggs, young, homes, or dens except as specifically provided for in other rules of Chapter 39, Florida Administrative Code.

Rule 39-27.011 of the Florida Wildlife Code prohibits "killing, attempting to kill, or wounding any endangered species." The "Official Lists of Endangered and Potentially Endangered Fauna and Flora in Florida" dated 1 July 1988, includes the wood stork, listed as "endangered" by the Florida Game and Fresh Water Fish Commission.

### 3. State of Georgia

Section 27-1-28 of the Conservation and Natural Resources Code states that "Except as otherwise provided by law, rule, or regulation, it shall be unlawful to hunt, trap, fish, take, possess, or transport any nongame species of wildlife..."

Section 27-1-30 states that, "Except as otherwise provided by law or regulation, it shall be unlawful to disturb, mutilate, or destroy the dens, holes, or homes of any wildlife;

Section 27-3-22 states, in part, "It shall be unlawful for any person to hunt, trap, take, possess, sell, purchase, ship, or transport any hawk, eagle, owl, or any other bird or any part, nest, or egg thereof..."

The wood stork is listed as endangered pursuant to the Endangered Wildlife Act of 1973 (Section 27-3-130 of the Code). Section 391-4-13-.06 of the Rules and Regulations of the Georgia Department of Natural Resources prohibits harassment, capture, sale, killing, or other actions which directly cause the death of animal species protected under the Endangered Wildlife Act. The destruction of habitat of protected species on public lands is also prohibited.

### 4. State of South Carolina

Section 50-15-40 of the South Carolina Nongame and Endangered Species Conservation Act states, "Except as otherwise provided in this chapter, it shall be unlawful for any person to take, possess, transport, export, process, sell, or offer of sale or ship, and for any common or contract carrier knowingly to transport or receive for shipment any species or subspecies of wildlife appearing on any of the following lists: (1) the list of wildlife indigenous to the State, determined to be endangered within the State...(2) the United States' List of Endangered Native Fish and Wildlife... (3) the United States' List of Endangered Foreign Fish and Wildlife ..."

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## Appendix 4

**DRAFT**

November 12, 2003

## **Supplemental Habitat Management Guidelines for the Wood Stork in South Florida**

### **Introduction**

The purpose of the Supplemental Guidelines is to provide assistance to the user in addressing resource questions for the endangered wood stork (*Mycteria americana*) in south Florida. These guidelines provide help in addressing impacts on the wood stork and supplement the *Habitat Management Guidelines for the Wood Stork in the Southeast Region* (HMG) (Service 1990) that is the principle guidance the Service relies on to provide management options for wood stork colony protection and species recovery.

The following discussion is intended to provide the user with some of the basic science and reasoning for the Supplemental Guidelines. More detailed discussions of the ecology of the wood stork are available in Service (1996; 1999) and Mitchell (1999).

### **Colony**

Wood storks nest in colonies and will return to the same colony site for many years so long as the site and the surrounding feeding habitat continue to supply the needs of the birds. Nesting colony life averages 115 to 120 days. Nest sites are generally in woody vegetation over standing water, or on islands surrounded by broad expanses of open water.

In response to deteriorating habitat conditions in south Florida, nest initiation has shifted to February and March with nestling dispersal in July through August. This shift results in the presence of young in the nest when the May to June rains flood marshes and disperse fish, resulting in loss of nestlings to weather events or starvation of the young from lack of concentrated prey.

### **Nest Productivity**

Research has shown that the more successful nesting efforts by storks result from a combination of average or above-average rainfall during the summer rainy season and an absence of unusually rainy or cold weather during the winter-spring nesting season (Kahl 1964; Rodgers et al. 1987). This pattern produces widespread and prolonged flooding of summer marshes, which maximize production of freshwater fishes, followed by steady drying that concentrate fish during the season when storks nest (Kahl 1964). During the summer months rain saturates thousands of acres of Florida and fish are able to reproduce and grow rapidly. By October, the rains taper off and the water recedes. The water areas fragment into hundreds of individual ponds that slowly

shrink as the dry season progresses, concentrating the fish. These become wood stork feeding sites.

Successful nesting colonies are those that have a large number of feeding site options. To maintain the wide range of feeding site options requires that many different wetlands, with both relatively short and long annual hydroperiods be present. During the wet season, wood storks generally feed in the shallow water of the short-hydroperiod wetlands and in coastal habitats during low tide. During the dry season, foraging shifts to longer hydroperiod interior wetlands as they progressively dry down (though usually retaining some surface water throughout the dry season).

Good feeding conditions usually occur where the water is relatively calm and uncluttered by dense thickets of aquatic vegetation and water depth is between 5 and 38 cm (2-15 in) deep. Generally a dropping water level is necessary to concentrate fish in suitable densities. Conversely, a rising water level disperses fish and reduces the value of a site as a feeding habitat. Typical wet season densities of fish range from 50 fish/m<sup>2</sup> in long-hydroperiod wetlands to 10 fish/m<sup>2</sup> in short-hydroperiod wetlands (Loftus and Eklund 1994). Based on the above, 2 ha (5 acres) of short-hydroperiod wetlands would be necessary to provide the same nutritional needs that 1 ha (2.5 acre) of long-hydroperiod wetlands would provide. However, each wetland type provides foraging needs during different times of the year making them non-interchangeable.

Nesting wood storks do most of their feeding between 8 and 64 km (5-40 mi) from the colony. Coulter (1987) found that in a wood stork colony, 62 percent of foraging areas were within 10 km (6.2 mi). Ogden et al. (1978) and Coulter (1987) suggest that wood storks generally use foraging sites located within about 50 km (31 mi) flight range of the colony. Coulter and Bryan (1993) note that although foraging areas may be 60 to 80 km (37-50 mi) from the colony, 85 percent are within 20 km (12.5 mi). The Florida Fish and Wildlife Conservation Commission considers 30 km (18.6 mi) as the core foraging area (CFA) for nesting wood storks (Cox et al. 1994).

Successful colonies are those that have limited human disturbance and low number of land-based predators. If adult storks are forced to leave their nests as a result of human disturbance, eggs or downy young may die quickly (less than 20 min) when exposed to direct sun or rain. Rodgers and Smith (1997) have recommended a buffer distance of 100 m (328 ft) from the nesting colony as the minimum distance for human disturbance.

Land-based predators may also affect nest productivity. Mammalian predators of wood stork nests include a variety of animals, such as raccoons and skunks. Generally, these dryland predators do not have access to the nesting colony except when water levels below the nests recede or when significant vegetation bridges (dense growths of water hyacinths, water lettuce, etc.) allow direct access to the nesting colony. Successful nesting colonies protected from land-based predators have been characterized as those that are surrounded by large expanses of open water or those where the nest trees are inundated at the onset of nesting and remain inundated

throughout most of the breeding cycle. Successful nesting colonies often have water depths between 0.9 and 1.5 m (3-5 ft) during the nesting season and also go through periodic dry-downs during the end of the dry season. The periodic dry-down facilitates recruitment of nest trees. Therefore, an important parameter in colony success from land-based predation is the hydroperiod (duration that an area is inundated) and hydrologic pattern (depth, timing, flow, and location of surface water) beneath the colony.

### Hydroperiods

#### South Florida

Nest colonies are typically flooded in late October to early November. There is a gradual drying of the foraging area with the colony site dry by late April to early May. From May to June rains begin the wet cycle.

#### Central and north Florida

Nest colonies are typically flooded in late February to early May. There is a gradual drying of the foraging area with the colony site dry by late August to early September.

### Breeding Cycle

In south Florida, wood storks generally begin their breeding cycle in November through January with peak activity in December. Nestlings disperse in late April through early May. In central and north Florida and other northern nesting sites, nesting activities begin in late February through April with nestling dispersal between July through August. Based on a 120-day nesting cycle, courtship and nest building requires 7-10 days, egg laying and incubation 25 to 27 days, hatchling growth to thermoregulation (chicks have down and feathers) approximately 28 days, growth to fledging an additional 42 days, and post fledging to colony dispersal 10 to 15 days. Rodgers and Schwikert (1997) report the greatest period of mortality occurs prior to hatching, with the second largest mortality during the nestling period from hatchling to 14 days. During these early periods of the breeding cycle, the nest is tended by at least one of the adults with egg protection and feeding of the young shared by both. During early nesting, when downy young are present, the adults may feed the young as often as 10 to 15 times a day. Growth is very rapid with the young at age 14 days, weighing 10 times more than they did at hatching and 25 times heavier at age 28 days (Service 2001). Fifty percent of nestling wood stork food requirements occurs during the middle third of the nestling period, which corresponds to age 28 to 56 days (Kahl 1962).

### Summary

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In review, the Service believes that in order to minimize take of the wood stork including loss of nest productivity and support recovery efforts, the following supplemental guidance is applicable for protection of the nest colony, primary and secondary zones, CFA, and adult foraging areas. The Service considers actions that affect the nest colony, primary and secondary zones, and CFA as direct effects and actions that affect wetlands outside the CFA as indirect effects. Each area requires certain protective measures.

### Protective Measures

#### Nest colony - 100 m (328 ft)

No human intrusion should be allowed within 100 m (328 ft) of the nest colony during the active nesting period (November through August). Colony entry for maintenance and management actions during other times of the year is acceptable. The nests and nest trees are protected year-round and should not be disturbed or removed.

Water level manipulation during the active nesting period should mimic the natural cycle. Hydroperiod cycle should be maintained to provide a minimum of 0.6 to 1.5 m (2-5 ft) of standing water below the colony during nest activity. Periodic dry-down of the nest colony should be provided to promote recruitment of new nest trees during the later part of the dry season cycle.

Since nest colony protection from land-based predators is based on seasonal wet-dry cycles, changes in hydrology should be coordinated to match seasonal rainfall events (see hydroperiod section above). Water levels surrounding dry-island nesting colonies should be managed to prevent access of land-based predators to the colony. Livestock should not be allowed access to the colony.

#### Primary Zone - 396 m (1,300 ft)

The primary zone includes the nest colony and a 396-m (1,300 ft) wide buffer surrounding the colony. Protections in the primary zone follow those listed in the wood stork HMG (Service 1990) and include both year-round and nesting-season protective measures.

Year-round measures include no native vegetation removal, maintain natural hydroperiod, and exclude the construction of buildings, roadways, towers, power lines, or canals. Nuisance species removal and normal maintenance activities may occur outside the nesting season.

Activities within the primary zone that are likely to be detrimental to a colony during the nesting season include an increase or change in human activity, an increase or change in livestock use, and aircraft/airboat operation closer than 152 m (500 ft) of the colony.

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**Secondary Zone - 366 m (1,200 ft)**

The secondary zone is important to storks for collecting nest material, roosting, loafing (restricted on Federal property), and feeding (especially important to newly fledged young). Protective measures in the secondary zone include changes in human activity above existing levels, alterations in area hydrology that might detrimentally affect hydrology of the primary zone, and any decrease in the area of wetlands and woods of potential value to wood storks for roosting and feeding.

**Core Foraging Area - 30 km (18.6 mi)**

In south Florida the CFA for wood storks is defined as a 30-km (18.6 mi) wide buffer around the nesting colony. The Service's goal in this area is to protect and enhance the foraging habitat for wood storks during the nesting season. Therefore, in order to reduce loss of nest productivity, which is considered take of a listed species, the Service recommends the following for wetland alterations within the CFA (including the primary and secondary zones).

**Wetland Enhancement**

Exotic species removal and/or hydrological restorations may occur within the primary and secondary zones outside the nesting season and any time of the year for the remainder of the CFA. For wetland enhancements and hydrological restorations, the current and historical ratio of short-hydroperiod and long-hydroperiod wetlands needs to be identified. The importance of each type of wetland has been discussed and should be the basis for the type of wetlands targeted for restoration purposes.

**Wetland Alterations**

The Service strongly recommends that wetland alterations within the CFA be avoided. If wetland modification within the CFA can not be avoided then compensation for the loss of this foraging resource is required. The Service considers that compensation should not only include the replacement of this resource, but also the growth time (temporal lag) necessary for the new resource to achieve foraging value equal to that provided by the original natural wetland. Of particular importance in the evaluation is the type of wetland, i.e., short or long hydroperiod. The Service (1999) describes a short hydroperiod as a 2- to 5-month wet/dry cycle, and a long hydroperiod as greater than five months. For wetland compensation, offering a short hydroperiod replacement for a long hydroperiod impact does not provide the same functional value to the colony. Also providing functional replacement outside the CFA of the colony does not provide the same resource value to the colony.

**Power lines and Cell Towers**

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Power lines and cell towers less than 61 m (200 ft) in height should be no closer than 1.6 km (1 mi) from a nesting colony. Towers greater than 61 m (200 ft) should be no closer than 4.8 km (3 mi) from a nesting colony.

**Adult Foraging Areas**

In addition to providing nutritional needs to wood storks nesting in south Florida, wetlands also provide non-breeding season foraging for north Florida, Georgia, and South Carolina populations (Service 1996). Typical foraging sites for the wood stork include freshwater marshes, stock ponds, shallow, and seasonally flooded roadsides or agricultural ditches, narrow tidal creeks, shallow tidal pools, managed impoundments, and depressions in cypress heads, swamps, and sloughs. Because of their specialized feeding behavior, wood storks forage most effectively in shallow-water areas with highly concentrated prey.

Therefore, actions that effect year-round foraging areas, *i.e.*, those outside the CFA, the Service recommends avoidance where possible, and functional replacement (including a temporal lag factor) for those systems that cannot be avoided. A wetland suitable for wood stork foraging needs to include a mosaic of emergent and shallow open water areas. The emergent component provide nursery habitat for small fish, frogs, and aquatic insects and the shallow, open-water areas provide sites for concentration of the prey during seasonal dry-down of the wetland. The compensatory wetland needs to mimic when possible the historical hydroperiod of the impacted wetland.

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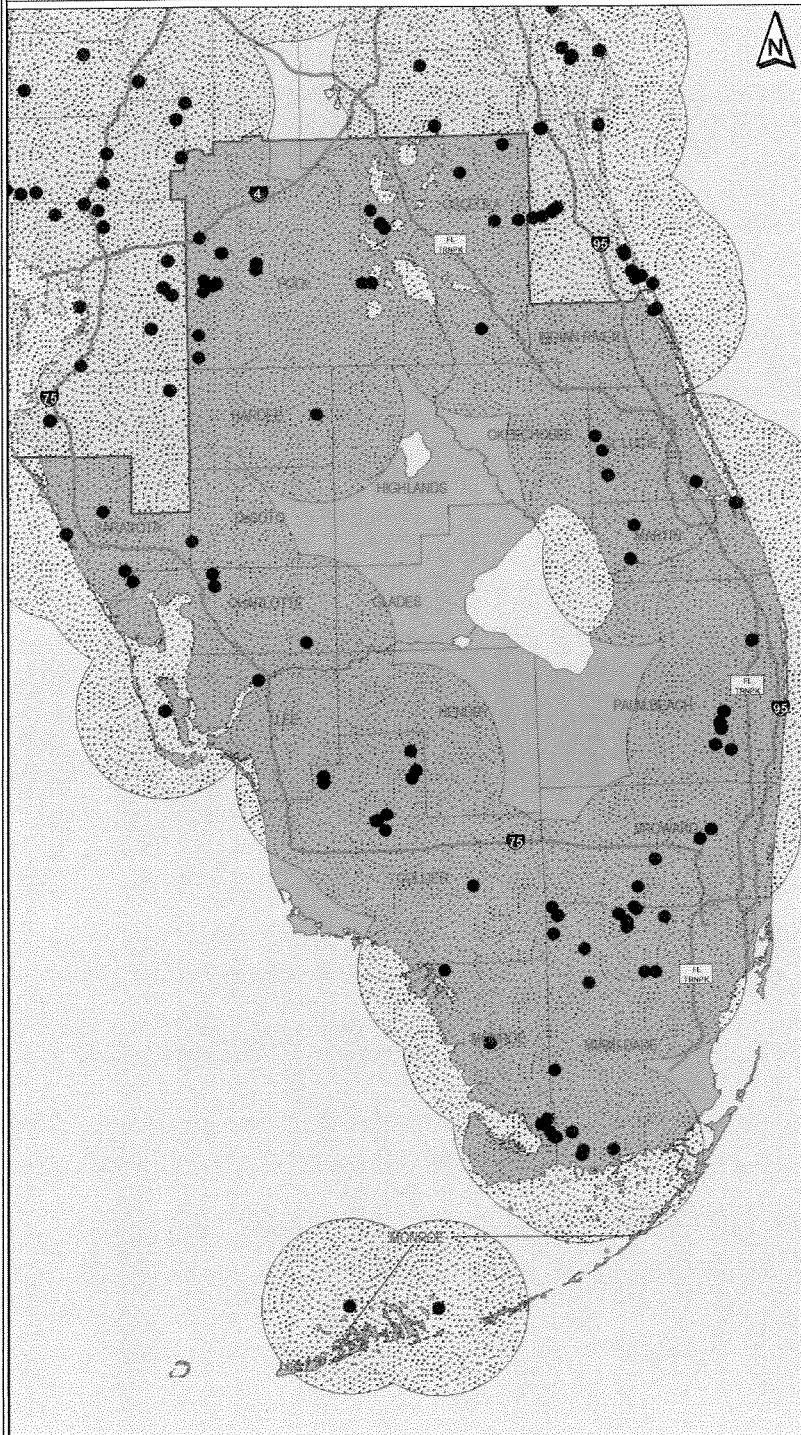
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## Appendix 5

# Wood Stork



## Nesting Colonies Core Foraging Areas

1999 to 2005

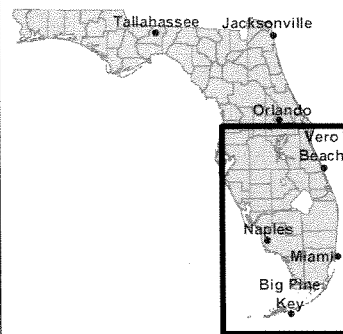
● Colony Location

▨ Core Foraging Area

■ South Florida  
Service Area



Produced by:  
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Appendix 6

**WOOD STORK FORAGING HABITAT  
ASSESSMENT PROCEDURE**

**DRAFT**

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## INTRODUCTION

This procedure provides a tool to assist the user in making a comparative assessment of the potential value of foraging habitat for the wood stork (*Mycteria americana*) on a land development site and on the proposed habitat compensation site, which are subject to a federal action (i.e., federal permit). This procedure should only be used after the appropriate regulatory agencies and permit applicant have agreed that foraging habitat compensation is an acceptable voluntary conservation measure for the wood stork.

The wood stork is listed as endangered and is protected under the Endangered Species Act of 1973. There is no critical habitat designated for the wood stork.

## METHODOLOGY

This wood stork foraging habitat functional assessment procedure is based on information obtained from the U.S. Fish and Wildlife Service's (USFWS) Draft Habitat Management Guidelines for the Wood Stork (1990 and 2002), Florida's Fragile Wildlife (Wood 2001), Rare and Endangered Biota of Florida (Rodgers *et al.* 1996), and local field knowledge.

The functional assessment is a rating index organized similar to the format utilized in the Wetland Rapid Assessment Procedure (WRAP) developed by the South Florida Water Management District (1997). However, this assessment has been established using three variables that are indicative of the necessities and functions of foraging habitat required by the wood stork. This specific functional assessment analyzes each wetland on-site. All three variables have a maximum score of 3.0 for optimal foraging habitat (Appendix A). After each variable has been rated, the final sum is divided by nine for a mean average of all three variables. The resulting score is then multiplied by the acreage of the wetland polygon for either the development site or habitat compensation site to determine the functional units of foraging habitat provided by that wetland. The variable scores and foraging habitat functional score are summarized using a data sheet (Appendix B).

### Prey Availability

The first variable is the availability of prey within the wetland assessment area. Optimal foraging depths occur in littoral areas that range from two inches to 15 inches in depth (Ogden 1990) with the water fluidity calm and without dense coverage of emergent aquatic vegetation (Rodgers *et al.* 1996). Also included in this rating index is an assessment of the wetland for small depressional pockets that will concentrate forage during a drying hydrologic regime (Ogden 1990). An optimal rating of preferred foraging habitat would score a 3.0 (Appendix A).

### Hydrologic Regime

The second variable is the hydrologic regime required for wood stork foraging. Appropriate hydrological regimes for wood stork foraging for larger wetland systems or water bodies should provide indicators indicative of a longer hydroperiod for interior wetlands during the dry cycle of

the drying season along with still providing some standing water in the dry season (USFWS 2002). Also, smaller water bodies or wetlands that demonstrate shallower hydrological regimes are necessary in the initial stages of the wet season to maintain required foraging depths compared to larger and deeper hydrological areas (Ogden 1990). Furthermore, these wetlands and water bodies should have strong hydrological connections such as ditches, swales, sheetflow, etc. to provide a stable amount of hydrology for supporting the appropriate densities of fish as prey (Rodgers *et al.* 1996). These three hydrological ratings are necessary to determine appropriate staging levels for adequate supplies of foraging prey and foraging depths. A combination of all above mentioned ratings would be considered as optimal hydrological regimes to supporting foraging habitat (Appendix A).

### **Water Quality**

The third variable assesses if the appropriate water quality is prevalent in the assessment wetland. It has been determined that the presence of chemicals such as fertilizers, pesticides, and herbicides can adversely impact prey species for the wood stork (Wood 2001). Also, elevated levels of organochlorine pesticides, PCBs, and mercury have been identified in small samples from wood storks (Rodgers *et al.* 1996). Therefore, an appropriate rating of the localized water quality is necessary to determine possible impacts to the wood stork. The rating index utilized is the same water quality, pre-treatment index utilized in WRAP (South Florida Water Management District 1997). This method evaluates the contributing areas to the wetland. This rating index is determined by the summation of the land use category with the pre-treatment category divided by two. The maximum score of each category is 3.0 (Appendix A).

## **SUMMARY AND DISCUSSION**

This procedure provides a tool in making a comparative assessment between impacts to wood stork foraging habitat resulting from a land development project and the proposed foraging habitat compensation. The habitat variables of prey availability, hydrologic regime, and water quality all play a role in determining the ecological function that a wetland provides for wood stork foraging.

This functional assessment provides a rating index for foraging habitat and does not assess roosting or nesting habitat. Rogers (*et al.* 1996) establishes that nesting habitat for colonies is optimal on isolated islands or in woody vegetated areas surrounded by vast areas of open water. Wood (2001) explains three to five feet in water depths is adequate to deter predators such as raccoons and skunks. These water depths also provide areas for alligators, which also may deter land based predators (Wood 2001). Night time roosting within the project site will be dependent on the locality of the nearest nest colonies. Ogden (1990) explains nesting storks traveling long distances (more than 40 miles) may feed at a site and roost nearby and travel back to the colony the following day. If nesting or roosting occurs on the project site, then additional variables would need to be considered if this assessment procedure is to be used to assess nesting and roosting habitat. This procedure also does not assess human induced disturbances. Wood (2001) found that nesting wood storks have a somewhat higher tolerance to human disturbances than other wading birds. General observations of wood storks feeding on roadside swales and water management lakes also indicate their comfort zone for human disturbances while foraging.

## REFERENCES

- Ogden, J.C. 1990. Habitat Management Guidelines for the Wood Stork in the Southwest Region. U.S. Fish and Wildlife Service. Pgs. 1-7.
- Rodgers, J.A., H.W. Kale, II, and H.T. Smith. 1996. Rare and Endangered Biota of Florida. Volume V. Birds. University Press of Florida. Gainesville, Florida. Pgs.31-41.
- South Florida Water Management District. 1997. Wetland Rapid Assessment Procedure (WRAP) Technical Publication. Second Edition. Natural Resource Management Division Regulation Department. South Florida Water Management District.
- Wood, D.A. 2001. Florida's Fragile Wildlife Conservation and Management. University of Florida. Gainesville, Florida. Pgs. 178-193.
- U.S. Fish and Wildlife Service. 2002. Draft Habitat Management Guidelines for the Wood Storks in the South Florida Ecological Services Consultation Area. Vero Beach, Florida.

**APPENDIX A**

**RATING INDICES FORAGING HABITAT VARIABLES**

## 1. Prey Availability

Descriptions	Score
<ul style="list-style-type: none"> <li>➤ Wetland or water body provides two to 15 inches of littoral depth for foraging purposes for the majority of the foraging area</li> <li>➤ Wetland or water body provides relative calm fluidity and without dense coverage of aquatic vegetation</li> <li>➤ Wetland contains many small depressional pockets for forage to become concentrated</li> </ul>	3.0
<ul style="list-style-type: none"> <li>➤ Wetland or water body provides two to 15 inches of littoral depth for at least half of the foraging area</li> <li>➤ Wetland or water body provides a calm fluidity motion with a few patches of dense aquatic vegetation</li> <li>➤ Wetland contains scattered depressional pockets for forage to become concentrated</li> </ul>	2.0
<ul style="list-style-type: none"> <li>➤ Wetland or water body provides two to 15 inches of littoral depths for at least some of the foraging area</li> <li>➤ Wetland or water body provides a calm fluidity motion with scattered patches of dense aquatic vegetation</li> <li>➤ Wetland contains few depressional pockets for forage to become concentrated</li> </ul>	1.0
<ul style="list-style-type: none"> <li>➤ Wetland or water body does not provide littoral foraging areas with two to 15 inches in depth</li> <li>➤ Wetland or water body does not provide a calm fluidity motion or has extreme coverage of dense aquatic vegetation</li> </ul>	0.0

## 2. Hydrologic Regime

Descriptions	Score
<ul style="list-style-type: none"> <li>➤ Wetland or water body provides indicators indicative of longer hydroperiods for interior wetlands during the drying cycle of the dry season</li> <li>➤ Wetland or water body provides indicators indicative of a short hydroperiod during the wet season to provide littoral foraging of appropriate depths when larger wetlands and water bodies are too inundated</li> <li>➤ Wetland or water body has a strong hydrological connection such as ditches, swales, sheetflow, etc. that provides more permanent hydrology to make available necessary fish densities for foraging</li> </ul>	3.0

## 2. Hydrologic Regime (Continued)

Descriptions	Score
<ul style="list-style-type: none"> <li>➤ Wetland or water body provides evidence of very few hydrological alterations for interior wetlands during the drying cycle of the dry season</li> <li>➤ Wetland or water body provides evidence of very few hydrological alterations during the wet season that will provide littoral foraging of appropriate depths when larger wetlands and water bodies are inundated</li> <li>➤ Wetland or water body has an adequate hydrological connection such as ditches, swales, sheetflow, etc. that provides more permanent hydrology to make available necessary fish densities</li> </ul>	2.0
<ul style="list-style-type: none"> <li>➤ Wetland or water body provides evidence of a moderately altered hydroperiod for interior wetlands during the drying cycle of the dry season.</li> <li>➤ Wetland or water body provides evidence of a moderately altered hydroperiod during the wet season that will provide some littoral foraging at appropriate depths when larger wetlands and water bodies are inundated</li> <li>➤ Wetland or water body has moderate hydrological connections such as ditches, swales, sheetflow, etc. that provides adequate hydrology to make available necessary fish densities</li> </ul>	1.0
<ul style="list-style-type: none"> <li>➤ Wetland or water body provides evidence of a severely altered hydroperiod for interior wetlands during the drying cycle that provide no available foraging habitat</li> <li>➤ Wetland or water body provides evidence of a severely altered hydroperiod during the wet season that provide no littoral areas when other areas have extreme inundation</li> <li>➤ Wetland or water body has no hydrological connection such as ditches, swales, sheetflow, etc. that could provide adequate hydrology for necessary fish densities</li> </ul>	0.0

## 3. Water Quality

Land Use Category	Score
Open Space/Natural, Undeveloped Areas	3.0
Unimproved Pasture/Rangeland	2.5
Citrus Grove	2.0
Sugar Cane	2.0
Low Density Residential	2.0
Low Density Commercial	2.0
Low Density Highway	2.0
Institutional	2.0
Single-family Residential	1.5

### 3. Water Quality (Continued)

Land Use Category	Score
Recreational	1.5
Golf Course	1.5
Moderately Intense Commercial	1.5
High Volume Highway	1.0
Industrial	1.0
Mining	1.0
Multi-family Residential	1.0
Improved Pasture	1.0
Row Crop	1.0
High Intensity Commercial	0.5
Dairy or Feed Lot	0.0
Pretreatment Category	
Natural, Undeveloped Areas	3.0
Wet Detention with Swales	2.5
Wet Detention with Dry Detention	2.5
Combination Grass Swales with Dry Detention	2.0
Grass Swales Only	1.0
Dry Detention Only	1.0
No Treatment	0.0

**APPENDIX B**

**WOOD STORK FORAGING HABITAT ASSESSMENT  
PROCEDURE DATA SHEET**

# Wood Stork Foraging Habitat Assessment Procedure

☒ Check One  
☐ Existing Conditions ☐ Proposed Conditions

USACOE Appl. No.  USFWS Log No.  Project Name  Date  Evaluator  Project/Mitigation Site

FLUCFCS Code  Description  Wetland Acreage  Wetland Number

Prey Availability

Hydrologic Regime

Water Quality

Land Use Category (LU)			
Land Use Category	(Score) X	(% of area)	=Sub Total
(LU) Total			<input type="text"/>

Pretreatment Category (PC)			
Pretreatment Category	(Score) X	(% of area)	=Sub Total
(PC) Total			<input type="text"/>

Score

Notes

Prey Availability

Hydrologic Regime

Water Quality